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## RECENT OIL AND GAS DISCOVERIES IN NON-OPEC COUNTRIES

This article updates and expands an earlier review of important oil and gas discoveries outside the OPEC nations since 1972. Successful development and sharing of production from these new deposits would significantly increase world petroleum supply and reduce dependence on OPEC countries. (Note: Numbers on the map correspond to the the following paragraphs.)

### Western Hemisphere

#### *Mexico*

1. *Chiapas and Tabasco States.* Recently announced plans by the Mexican government to regain crude oil self-sufficiency in the 1974-76 period were unexpectedly achieved by July of this year. Rapid growth in oil production from newly discovered fields in the southeastern - Cactus, Citio Grande, and Samaria - producing area is far outpacing plans. Oil output in the first half of 1974 increased sufficiently to allow Mexico to surpass its previous production record of 521,000 b/d set in 1921, terminate oil imports (which reached 65,000 b/d in 1973), and declare an exportable surplus of 30,000 b/d - 60,000 b/d. Crude oil production from the new southeastern fields grew at the rate of 10,000 b/d per month during the January - mid-September period, rising from 150,000 b/d to 229,000 b/d, and it is expected to hit 250,000 b/d by yearend. The government has earmarked \$1.4 billion for further exploration and development of 12 to 15 new structures in this area during 1974-76. Mexican oil output is expected to reach 767,000 b/d by January 1975 and to exceed 1 million b/d in 1980, largely as a result of these new fields. The 1980 production level rests on the discovery of about 2 billion barrels of recoverable oil. (Unclassified)

#### *Canada*

2. *Arctic Islands-Beaufort Sea.* Five very large but remote natural gas fields and two oil and gas deposits have been discovered in the Sverdrup Basin - Beaufort

\* Petroleum geologists consider any field with proved reserves of more than 500 million barrels to be "giant." "Major" fields have reserves of between 100 million and 500 million barrels.

Sea area. Gas reserves currently are estimated at 24 trillion cubic feet (cu ft), including 7 trillion cu ft at Drake Point on Melville Island. Data are insufficient to assess oil reserves. Available geophysical and geological information indicates that Sverdrup Basin reservoirs are of Middle East quality; daily well flows of 5,000-10,000 barrels of oil and 20 million-40 million cu ft of gas have been reported. More than 200 seismic structures have been mapped, but most are still undrilled. Some anticlines are 100 miles long. The rock column is completely intact with sediments that are up to 30,000 feet thick and embrace all of the world's known producing strata. (Unclassified)

3. *Mackenzie River Delta.* Discoveries to date include at least seven multizone gas condensate deposits, containing reserves of about 40 trillion cu ft and four oil fields, some with Devonian reef reservoirs. Commercial gas development awaits the discovery of a few more large deposits to justify construction of a pipeline to southern markets. (Unclassified)

4. *Offshore Labrador.* Eastcan Ltd., a group of US-French Canadian subsidiaries, is reported to have made a big oil discovery at the Bjarni wildcat about 50 miles off Labrador's eastern coast in 1973. Evaluation drilling resumed this August at a second wildcat, the Gudrid, to the southeast, and it also has encountered oil shows which have not yet been tested. The drillship Pelican will return to the Bjarni discovery well for additional formation testing after the Gudrid is completed. "Iceberg Alley" is a difficult place for drillships to work. Ice conditions forced the operators to evacuate the Bjarni area before testing was completed last fall, and the Pelican already has sustained some damage at the Gudrid site. (Unclassified)

5. *Offshore Nova Scotia and Newfoundland.* Despite considerable drilling on the continental shelf bordering Sable Island, about 100 miles off Nova Scotia, no outstanding successes have been achieved. Several natural gas condensate discoveries are potentially commercial; they have yielded test flows of up to 12 million cu ft of gas and 1,000 barrels of condensate per day. Lateral extension wells at these deposits have proved disappointing, however, and more evaluation drilling is needed to complete the geological picture. Elsewhere, drilling activity has picked up off Newfoundland and in the St. Lawrence Gulf. (Unclassified)

#### *Central and South America*

6. *Guatemala.* The Shenandoah Oil Group has reported two oil finds - 11 miles apart and in different producing zones - on a 900,000-acre concession in northern Guatemala. One find flowed 2,250 b/d from Cretaceous zones at depths of 4,100 and 5,250 feet. Productive zones are thin, but depths and reservoir conditions are favorable. Deeper zones also appear promising but have not yet been tested. The other oil discovery occurred at 2,400-foot depths on a salt dome 120 miles north of Guatemala City. Producing potential of this reservoir was rated at 5,000 b/d to 10,000 b/d of 35-degree gravity oil. Neither strike can be declared commercial until the pool limits are delineated. (Unclassified)

7. *Peru-Amazon Basin.* The biggest exploration drilling boom in South America is still under way in the remote provinces east of the Andes Mountains. Of the 42 structures so far seismographed, 15 have been drilled and declared oil discoveries by Petroperu and Occidental Oil Co. Petroperu, the state oil company, has budgeted funds for an additional 385 exploratory wells during 1974-76. Farther south, many other companies have joined in the oil hunt; exploration activity is spreading into Brazil and Bolivia.

Peru claims that 400 million barrels of oil reserves had been found as of the end of 1973 - 300 million by Occidental. Oil production is expected to rise to 79,000 b/d in 1974, 300,000 b/d in 1976, and about 1 million b/d in 1979. Reservoir porosities, permeabilities, and water drives are good but water "coning" has caused some serious production problems in Petroperu's fields. (Unclassified)

8. *Chile-Argentina-Tierra del Fuego.* Chile's state oil company, ENAP, claims to have found a 470 million-barrel offshore field in the Straits of Magellan between Cabo Dungeness and Punta Delgada in 1973. This year, Argentina's state oil firm, YPF, started offshore exploration to the north and southeast of the Chilean discovery. Argentina's offshore continental shelf, including the Falkland Islands plateau, represents one of the largest and most promising unexplored areas in the world. (Unclassified)

#### Eastern Hemisphere

##### *Western Europe*

9. *North Sea.* Nine giant oilfields have been discovered thus far in the northern half of the North Sea, each containing between 1 billion and 2 billion barrels of oil. Another two dozen finds of smaller size boost the North Sea's present recoverable reserves to 15 billion barrels. About 460 exploratory wells had been drilled in the North Sea by the end of 1973, some 200 in the northern sector. Only the 80 most promising prospects out of a total of 220 structures have been drilled. Many of the best prospects, located in Norwegian waters, remain unexplored because of government policy. Potential recoverable reserves could eventually amount to 40 billion barrels of oil plus 50 trillion to 100 trillion cu ft of natural gas. Most gas fields were found during 1965-70 and are in the southern half of the North Sea.

High discovery rates are being maintained in both the Norwegian and British sectors, with one out of eight wildcats striking oil. Drill-stem tests of most reservoirs recorded low gas-oil ratios; with early pressure maintenance by water injection, however, these reservoirs could match or exceed the productivities of many Middle East fields. Well flows of 8,000 to 15,000 b/d have been reported at many deposits. Production rates could reach 3 million b/d in 1980 and 5 million to 6 million b/d by 1985, given additional discoveries and the absence of political constraints on output. North Sea oils are high-quality 35-44-degree gravity crudes with only 0.2% - 0.4% sulfur content. They resemble North African oil, which is ideally suited for

North European refinery needs in the production of distillate fuels. Low transport costs and current prices should make any deposit containing 200 million barrels or more of recoverable oil commercially feasible. (Unclassified)

10. *Ireland.* Marathon Oil company has discovered a small gas field off Kinsale on the southern coast, containing about 1 trillion cu ft of gas. Exploration activity has also been spurred by reports of the area's first oil show in a wildcat well recently abandoned by Esso. (Unclassified)

11. *Sweden.* A small oil find, which could extend into the Baltic Sea, has been made by the state oil company on the island of Gotland. More prospecting is planned by the Swedes and the Finns. When fully developed, the Swedish find is expected to produce 40,000 b/d. (Unclassified)

12. *Greece.* Oil has been discovered in a large structure called Prinou, about 10 miles off Kavalla in the Aegean Sea. Development plans provide for initial producing capacity of about 50,000 to 100,000 b/d. Prior reports that the structure contains 2 billion barrels seem premature; only two wells have been drilled so far. (Unclassified)

13. *Italy.* The Italian State Oil Company, ENI, and its partners continue to find small gas fields in offshore waters of the Po River Delta in the Adriatic Sea. Elf Italiana has reported the Adriatic's first offshore oil discovery, which is small but somewhat promising. A deep onshore gas discovery has also been made near Milan; it tested 16 million cu ft of gas and 1,600 barrels of condensate per day from a 17,389-foot-deep Pre-Tertiary reservoir. Deeper gas horizons in the old Po Valley producing region could prove significant. The one well completed thus far could supply up to 15% of Italy's annual gas requirements, if current well flows are sustained. (Unclassified)

14. *Spain.* One offshore oil field has been found by Shell, at the mouth of the Ebro River on the eastern coast. This pool, the Amposta Marino, should produce 20,000 b/d initially. The crude is a very heavy, low-quality oil with high sulfur content, but domestic refineries can adapt to its specifications. (Unclassified)

#### *Africa*

15. *Egypt.* Amoco placed its new July Field on production after the Arab-Israeli truce. This deposit, which is located in the Gulf of Suez and northwest of the large El Morgan Pool, contains about 600 million barrels of oil. Production should reach a peak of 100,000 b/d in 1975, helping to make up for the prolonged decline in El Morgan output. (Unclassified)

16. *Tunisia.* Amoco has reported a 290 million-barrel discovery at Ashtart, 120 miles off Sfax in the Gulf of Gabes. With its capacity of 25,000-40,000 b/d, the new oilfield should offset depletion of older finds and raise Tunisian oil output to 100,000 b/d in 1975. (Unclassified)

17. *Equatorial Africa's West Coast.* Numerous oil discoveries have been reported along the continental shelf: three in Gabon, two in Congo, two possibles in Zaire, one in Cabinda, and two or three in Angola. One giant 7 billion-barrel field has been found at Emeraude, offshore Congo, but the high viscosity of this oil may permit only 7% recovery of the reserves in place. Oil potential elsewhere in the area is good. Several major companies are interested in the far reaches of the continental slope, where possible salt dome structures and associated oil traps are believed to exist beneath 10,000 feet of water. Shell recently started to drilling in 2,150 feet of water off Gabon -- a world record for water depth in exploratory drilling. (Unclassified)

*South and Southeast Asia-Oceania*

18. *India.* The state-owned company, ONGC, has succeeded in discovering oil on the "Bombay High" in offshore waters about 115 miles northwest of the city of Bombay. After a decade of unproductive effort with cumbersome Soviet equipment, the Indians last year acquired a new Japanese-built offshore drilling platform that enabled them to drill and test this large structure. As a result, about 500 b/d of high-quality 43-degree gravity oil and 1.5 million cu ft of gas were recovered from 3,300-foot depths. Further evaluation is needed, but ONGC expects the well to produce 3,500-4,000 b/d. India also has recently opened up its offshore continental shelf in the Bay of Bengal and in the Gulf of Kutch to two groups of US oil firms; seismic operations are about to get under way. (Unclassified)

19. *Bangladesh.* Six gas fields, containing about 4 trillion cu ft of natural gas reserves, have been found. Offshore oil leases were recently granted to a group of US oil firms, and seismic boats are due to start operations soon. (Unclassified)

20. *Burma.* A US drilling contractor working for the Burmese State Oil Company (MOC) has struck oil and gas in commercial quantities in the Gulf of Martaban, south of the Irrawaddy River Delta. Onshore exploration of the Arakan Coast along the Bay of Bengal is getting under way following the delivery of several new US drilling rigs. Offshore waters of the Andaman Sea to the south also have been opened up to Western companies during the past year. Exploration activity should increase markedly as a result of several shows of oil and gas. (Unclassified)

21. *Thailand.* Tenneco, Union, and Gulf are testing possible commercial gas, condensate, and oil discoveries off the east coast in the Gulf of Thailand. Along the western continental shelf, in the Andaman Sea, new exploration licenses have been issued to several US companies during the past year. Because the country's offshore petroleum potential is regarded as highly favorable, exploration activity is expected to intensify. (Unclassified)

22. *Malaysia-Brunei.* The Malaysian-Brunei sector of the South China Sea is southeast Asia's second most successful petroleum exploration area, after Indonesia. Approximately 15 offshore oil and gas finds have been recorded to date. Six oil and four gas fields discovered in Malaysian waters since 1972 appear to be

commercial. Malaysian oil production is expected to jump from 100,000 b/d last year to 500,000 b/d in 1976 and 800,000 b/d in 1980. Natural gas production may reach 1 billion cu ft per day by the end of the decade.

Brunei has long been a large oil producer, with output averaging 225,000 b/d in 1973. New offshore discoveries should boost oil and gas production considerably. Shell, the area's most successful operator, has made 10 discoveries in Sarawak, Brunei, and Sabah. Esso, Continental, and Total have drilled five oil and gas discoveries in Malaysian waters. (Unclassified)

23. *Australia.* The Woodside-Burmah combine has found six major gas deposits and one major oil pool on the northwest continental shelf. The Arco Group has discovered oil in the Timor Sea 160 miles north of Australia. This wildcat flowed 4,270 b/d of 42-degree gravity oil from a thin shallow sand at 6,600-foot depths; the absence of a thick reservoir nevertheless will require additional drilling to determine the commercial value of the prospect. Esso - Broken Hill Party has discovered multizone oil and gas accumulations off Victoria in Bass Strait, where recoverable oil reserves now exceed 2 billion barrels. (Unclassified)

24. *New Zealand.* Development of the large Maui gas condensate field in 400-foot-deep waters off the southwest tip of North Island is now beginning. Reserves are estimated at 5 trillion cu ft of recoverable gas plus several hundred million barrels of natural gas liquids. (Unclassified)

#### *Far East*

25. *Japan.* Amoco has found an oil and gas field off Niigata, on the west coast of Honshu Island. Discovery and evaluation wells flowed up to 1,500 barrels of oil and 35 million cu ft of gas daily. A production platform for 12 wells was installed in 330 feet of water this spring. Esso has made a commercial gas discovery 25 miles off Iwaki on Honshu Island's east coast. This well flowed 30 million-35 million cu ft of gas per day, and further evaluation is now in progress. Shell is reported to have a major offshore oil and gas discovery 45 miles southwest of Nagasaki on Kyushu Island, where 10 producing zones were penetrated by one well. (Unclassified)

26. *Taiwan-Republic of China.* The Amoco-Conoco-Chinese Petroleum Group has reported an important discovery of natural gas condensate off the southwest tip of Taiwan in the Formosa Straits. The exploratory well was located in 400 feet of water and drilled to a 12,950-foot depth. Daily flow rates of 25 million cu ft of gas and 250 barrels of condensate were reported. Further evaluation drilling of the prospect is planned. (Unclassified)

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### Recent Worldwide (Non-OPEC) Oil and Gas Discoveries

